

MISSOURI

resources

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Missouri Department of
Natural Resources



Director's Comment



Doyle Childers on his first hybrid vehicle.

you run toward them, you'll probably fall so often you'll lose your way. I'd like to think that marching toward your goals is the best way.

Twenty-two years in the Missouri legislature proved one irrefutable fact to me – every decision, no matter how big or small – benefits most from the input of those affected. That fact was not forgotten when I accepted my appointment from Gov. Blunt to run this agency. That fact guided so much of what all of our team strived to improve here – increasing the public's ability to interact with the department and access the things it has to offer. Just as importantly, we needed to improve their ease in doing so. Well, we built that access road, and the traffic was heavier than we could have ever hoped for.

Back in Costa Rica, I signed up for a two-year hitch – the standard deal. That wasn't enough, I had to see some things through so I stayed another two-plus years. In Central America, it was all about building schools and getting tiny power plants up and running. Today, it's education and information via the Internet and massive wind farms. They had associations and juntas, we have boards and commissions. The process is still the same. Identify your need, find a way to fund it, seek the input of the citizens who need it, and go build your road.

We must now look to the future to sustain our successes. Re-evaluating this agency's funding structure will be an important part of that process. Today, 50 different funds make up the funding structure for the Department of Natural Resources. Proposals to fund environmental efforts through a tax that would be approved by the public, might receive considerable support from public and private entities.

I have enjoyed meeting so many of you over these last four years, and I have been honored to work beside you toward many common goals. It is my hope you will honor my successor with that same interest and effort.

Sooner or later, I'll return to where this journey began – the hills of my beloved Ozarks. With apologies to our friends at MoDOT, I might just find a road that needs some building.

Doyle Childers

Doyle Childers

Missouri Department of Natural Resources



Forty years later... still driving a hybrid.

MISSOURI resources

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Get Bizzy Saving Energy



DNR photos by Scott Myers

Above right: The coal-fired boiler unit one at City Utilities of Springfield's Southwest Power Station has been in operation since 1976.

Above: Mid-winter snow covers the low-hanging branches of a burr oak in Columbia.

FRONT COVER: Broken sunlight reflects off the waves at Mark Twain Lake in Monroe County.


BACK COVER: Nathan Boone Homestead State Historic Site features a cabin built in the 1830s.

Cover photos by Scott Myers.

The Road to ReTIREment

by Andrea Morrow

DNR photo by Bruce Tylke



What happens when tires get old and bald? Do they retire to a happy tire farm and roll around all day with their old tire friends? Do they go to tire heaven and finally get to rest under the car of their dreams? Or do they go anywhere at all? Where exactly have all the tires gone? Most of us probably don't know where our tires go after they are replaced. In reality, the road to retirement can truly vary – but not all destinations are prime locations.

Missourians generate about 5 million scrap tires per year, or

roughly one tire per person. Whole tires are banned from landfills in Missouri. If a tire has been cut lengthwise like a bagel, into three equal parts, or if the side walls are cut out, it can be placed into a landfill. However, cutting tires can be very difficult and hazardous. Steel belts and bead wire inside the tires are sharp and can harm the person cutting the tires. Usually, this is a task best left to the professionals.

In 1990, millions of tires littered Missouri's environment. Illegal disposal of scrap tires in Missouri was so widespread the state legislature passed the first scrap tire law. State legislators established a 50-cent-per-tire fee that retailers collect when a new tire is purchased. A percentage of the money from the fee is allocated to pay for cleanups,

“If the fee were dropped and then reinstated one year later, it would take up to three years to clean up all the illegal dumping that would occur”

– Chris Smith, ABC Tire, Kansas City.

provide scrap tire grants and maintain inspection and enforcement practices. A small portion of the fee also goes for solid waste and scrap tire education activities.

The first scrap tire fee expired Jan. 1, 2004, but it was later reestablished by the legislature and went into effect on Aug. 28, 2005. During this 18-month period, the department estimates nearly a half million tires were illegally dumped while it was unable to conduct its inspection and enforcement activities.

Unfortunately, two large tire fires occurred in the state during this period of time. One of those fires occurred on March 11, 2005. An illegal tire dump in Polk County, containing an estimated 750,000 tires, blazed for several months in an abandoned quarry near Bolivar. When tires catch fire, they can burn and smolder for months, as they are difficult to extinguish. Nineteen area volunteer fire departments battled the blaze for days before deciding to let the fire burn itself out. Neighbors feared that grass fires sparked by embers from the burning tires were going to encroach upon their homes. Fortunately, they didn't. The fire burned so intensely that some equipment and hoses used by the firefighters were destroyed by the heat. The fire did not cause any injuries or deaths but

inflicted significant damage on the environment. Fires from scrap tires release hazardous substances into the air. When the tires melt, oil can seep into groundwater sources creating environmental problems. Tire fires also leave tremendous scarring on the land.

Just a few days later, on March 14, 2005, nearly 20,000 tires caught fire near Orrick, just east of Kansas City. Oil leaked from the burning tires and flowed to nearby Bogart Creek. The Department of Natural Resources used absorbent pads to remove oil from the creek.

Another serious and highly visible danger in scrap tire dumps is mosquitoes that carry the West Nile virus. Missouri had its first documented human cases of West Nile virus in 2002. Since that time, nearly all Missouri counties have had documented cases. Scrap tires provide ideal breeding grounds for mosquitoes.

Scrap tires don't have to become dangerous eyesores or habitats for mosquitoes. When Missourians dispose of or recycle scrap tires properly, they can provide several beneficial uses. Shredded tires and crumb rubber can be used as playground surfacing material, rubberized asphalt and as an alternative fuel source in power plants. The Uni-

(Opposite page) Shown are some of the 789,000 tires in a Cass County quarry known as the Bishop Tire Dump.

(Below, left) A rural firefighter works to put out a blaze in a large illegal tire pile south of Hannibal in May 2005.



DNR file photo

Hannibal Courier-Post photo



DNR file photo

Illegal tire dumps once spoiled the landscape along Missouri roadsides and on private property. Since 1990, the Solid Waste Management Program has helped remove 15 million scrap tires from the environment.

versity of Missouri power plant has been using tire-derived fuel for several years.

Fortunately, illegal tire dumps are not the problem they once were due to the efforts of the department's Scrap Tire and Illegal Dumping Unit. Regulations for tire hauling and disposal have been strengthened and the records of tire haulers are reviewed on a

regular basis. With the help of education, inspection and enforcement activities, funded by the scrap tire fee, illegal scrap tire dumping is becoming a thing of the past.

To help increase the number of tires reported and cleaned up from smaller sites in Missouri, the department created the Tire

Dump Roundup Program in 2006. To qualify, property owners must have between 500 and 10,000 tires on their property and must not operate an active tire business. The program allows Missouri private property owners to self-report tire dumps on their property and have them cleaned up free-of-charge, using the scrap tire fee. The owner must sign an access agreement that states that if a property owner violates the solid waste management law in the future, the department can proceed with assessing penalties and cost recovery for the cleanup. As of Sept. 1, 2008, nearly 200 sites, containing approximately 600,000 tires, have applied for this highly popular



DNR photo by Bruce Tylke

The Bishop Tire Dump in Cass County, one of the largest in the state, was cleaned up in 2006.

and successful program. The Missouri Department of Corrections' Vocational Enterprises Program provides the labor for the cleanups and has handled nearly 50 percent of the sites enrolled in the program.

To date, more than 15 million tires have been cleaned up in Missouri. The department has spent more than \$17 million on tire cleanups and grants since the fee was created in 1990. The scrap tire fee provides the department with the financial ability to maintain oversight and clean up scrap tires from Missouri's environment.

The scrap tire fee will expire again on Jan. 1, 2010, unless it is extended by the legislature during the 2009 legislative session. Of the states that charge a fee when new tires are purchased, Missouri has one of the lowest fees in the country. Fees range from 25 cents per tire to \$2.50 per tire in some states.

Chris Smith, of ABC Tire in Kansas City, is a tire hauler that wholeheartedly endorses the fee. Scrap tire haulers are licensed by the state to take the tires to plants that use tire-derived fuel or factories that turn the tires into crumb rubber. Scrap tire processing facilities are also permitted by the state. Smith feels there is no benefit to letting the fee lapse.

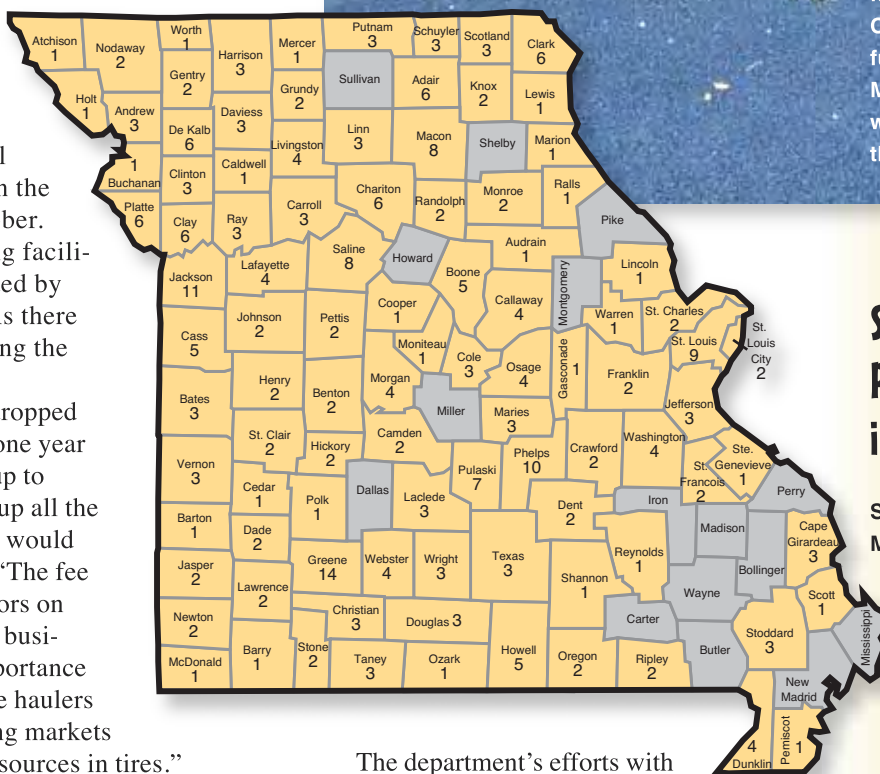
"If the fee were dropped and then reinstated one year later, it would take up to three years to clean up all the illegal dumping that would occur," Smith said. "The fee provides for inspectors on the streets, educates businesses about the importance of using licensed tire haulers and assists in opening markets for the renewable resources in tires."

With the number of illegal tire dumps dwindling, the department's Scrap Tire and Illegal Dumping Unit is moving its focus toward creating more end markets for scrap tires. The Missouri Department of Transportation is currently using rubber-modified asphalt, derived from scrap tires, in several projects, including 10 miles of Interstate 29 near Rockport.



The crumb rubber surface in the Jamesport City Park Playground, funded with Scrap Tire Material Grant funds, was made from more than 3,000 tires.

DNR photo by Stephen Krabbe



Scrap Tire Material Playground Projects in Missouri

Source: DNR Solid Waste Management Program

The department's efforts with inspection and enforcement of scrap tire law, awarding grants for end uses of scrap tire rubber and educational activities must be continued to keep illegal dumping of scrap tires a thing of the past. 🌞

Andrea Morrow is a public information specialist with the department's Solid Waste Management Program.

Watershed of Information

by Victoria Lovejoy photographs by Scott Myers



Missouri's drinking water from nonpoint source pollution.

The committee also received some assistance through the Water Quality Improvement Project. U.S. Sen. Kit Bond and former Sen. Jim Talent worked to provide that \$10 million/five-year water quality initiative for watersheds in southwest Missouri.

The training center's three-year goals are to provide enhanced curriculum with continuing education credits to at least 200 installers and inspectors and to encourage correct installation, maintenance and inspection of on-site septic systems.

"The days of on-site system installers being just good backhoe operators are about over," said Loring Bullard, watershed committee director. "For today's advanced systems and fitting the right system to difficult sites, installers need much higher levels of knowledge and training."

Trainers and students are able to evaluate the designs, performance, construction, maintenance and trouble-shooting on 10 different systems, partially installed in-ground, at the center. Visitors can examine low-pressure pipe, manifold, siphon, drip irrigation, three kinds of pretreatment units, conventional tanks, pump tanks, a miniature lagoon, trench technologies, control panels and alarms.

Bullard said locating this type of training module in the Ozarks adds an important element that cannot be found elsewhere.

"Ozark sites are often particularly difficult, with everything from steep slopes and no soil or extremely rocky soil to flat areas



Michael Kromrey, Watershed Committee of the Ozarks (WCO), takes his job title, "education outreach coordinator," very seriously. In fact, he coordinates the outdoor education of wastewater system installers.

Kromrey said the committee wanted to improve wastewater systems training at its Watershed Center in Springfield. Their students are now learning outdoors in a field of pretreatment units and conventional tanks at the Onsite Wastewater Training Center (OWTC). The training facility was made possible thanks to a Missouri Department of Natural Resources Nonpoint Source Implementation (319) Grant.

"We are required to find 40 percent matching funds for the 319 grant, which equals \$123,000," he said. "Manufacturers, retailers and on-site wastewater contractors donated about 95 percent of the equipment."

Section 319 of the federal Clean Water Act allows the U.S. Environmental Protection Agency to fund the "319" grant program through the Department of Natural Resources. Educational institutions, local governments and not-for-profit organizations can apply for 319 funds to help protect



"For today's advanced systems and fitting the right system to difficult sites, installers need much higher levels of knowledge and training."

— Loring Bullard, director,
Watershed Committee of the Ozarks

with hardpan clays that prevent downward percolation," he said. "Therefore, it is imperative that we do a better job of selecting and installing the right system that will work under these conditions."

The Missouri Smallflows Organization (MSO) held the first class at the training center. Installers, inspectors and soil evaluators attended an operation and maintenance course in August 2007. MSO is a nonprofit organization with members involved in the on-site wastewater industry.

"MSO is very excited about the location of the OWTC," said David Casaletto, MSO executive director. "The site was constructed so the simulation of maintenance and repair problems using actual equipment and tanks can be achieved. This type of hands-on training is a great supplement to classroom teaching."

As administrator of the Greene County Resource Management Department, Tim Smith, professional engineer, is proud of the collaborative working relationship his department has with WCO, MSO and the other agencies involved in the center.

"The OWTC is huge for us," said Smith. "Our ability to work together is noteworthy, because it's fairly unusual and [accomplishes] so much more with limited resources."

Smith said the on-site wastewater certification program also helps foster a cooperative relationship with local contractors.

"We are most successful when contractors and suppliers view us as a knowledge-

able and reliable resource, not just an enforcer," said Smith. "The training center will help us take this to the next level."

The watershed training center will eventually include four outdoor classroom facilities, two miles of trails, water quality laboratories, a wastewater recycling system and a state-of-the-art green building with workshop spaces and meeting space for up to 150 students and professionals.

To learn more about The Watershed Committee of the Ozarks, the Watershed Center and the OWTC, go to [www.watershedcommittee.org].

Another outdoor on-site wastewater training facility exists in central Missouri. The Missouri Department of Health and MSO coordinate training and certification of contractors and others at the University of Missouri Bradford Research and Extension Center in Columbia.

For details, visit the Missouri Small Wastewater Flows Education and Research Center at [aes.missouri.edu/bradford/news/mso-ffc-stm].

For more information regarding the Department of Natural Resources' Water Pollution Control Branch, visit [www.dnr.mo.gov/env/wpp/wp-index.html]. ☀

Victoria Lovejoy is a public information specialist for the department's Field Services Division at the Southwest Regional Office in Springfield.

(Opposite page, bottom) Michael Bowers, of Greene County's environmental staff, explains an above-ground drip irrigation system for wastewater.

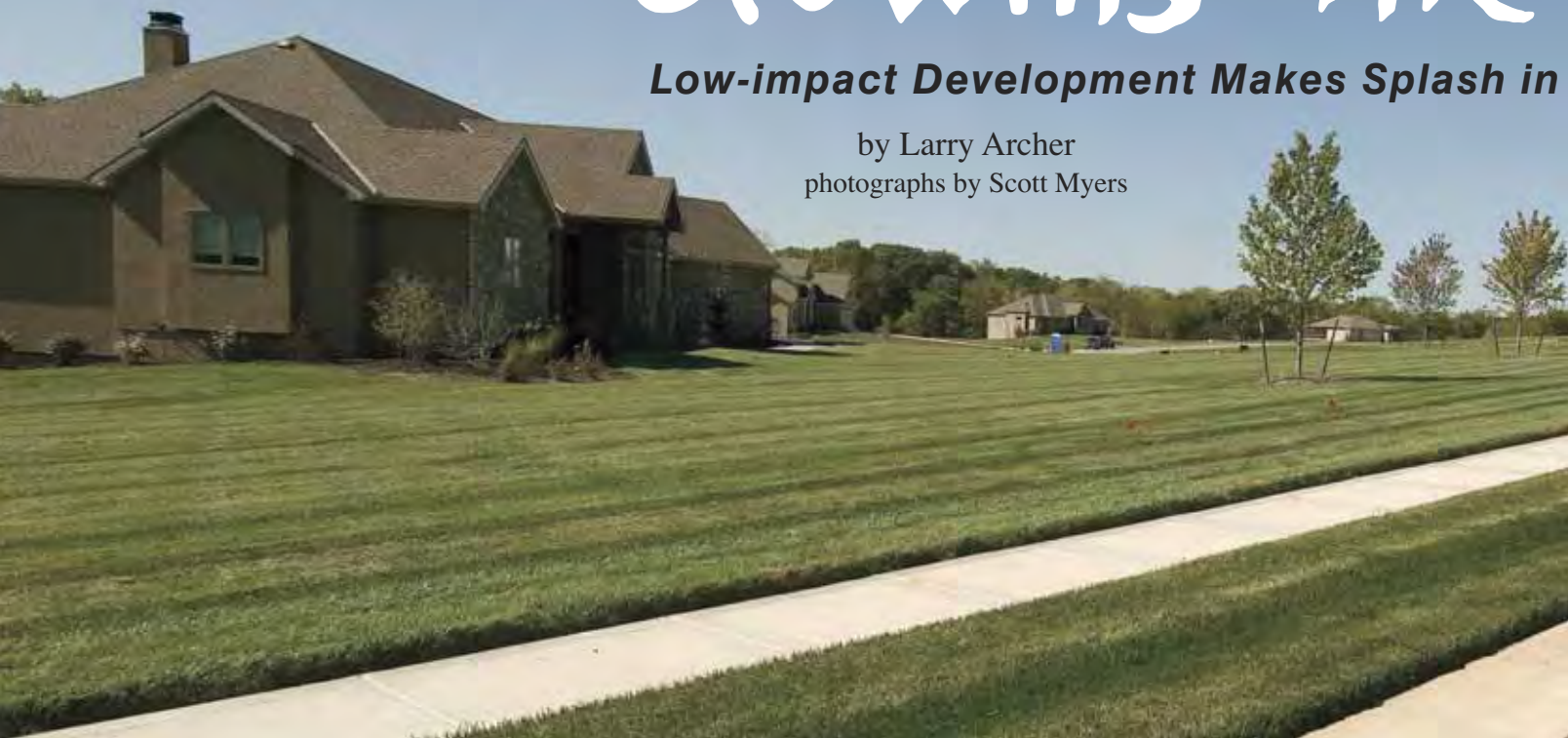
(Opposite page, top left) Bowers describes advanced wastewater treatment from the top of a pump tank. (Opposite page, right) Bowers displays a "peanut pipe" system that uses polystyrene packing material to increase the effectiveness of a traditional lateral drain field.

(Above, left) Karen Elmer, center, of the Greene County environmental staff, explains a low-pressure pipe system from the top of the wastewater storage and pump tank.

Slowing the

Low-impact Development Makes Splash in

by Larry Archer
photographs by Scott Myers



Low-impact development uses flat, ribbon curbs that allow storm water to run off the street into yards, where

it is absorbed into the ground. Traditional raised curbs move water and potential pollutants off site where they may negatively impact streams and rivers. (Opposite page) Developer Brian Burton explains how expanding cul-de-sacs and building rain gardens in the center helps manage storm water runoff, reducing its impact on the environment.

A few rainy days vacationing with the colonists led Brian Burton to become something of a pioneer, himself.

As a wet and stubborn weather system threatened to wash out the family vacation to Colonial Williamsburg, Va., Burton, a Clay County developer, started looking at the 300-year-old community from a developer's viewpoint.

"Three days we were down there it was pouring down, and we were wondering where all the water was going," Burton said.

So instead of retiring poolside at the hotel, Burton started researching what he would later discover is referred to as low-impact development – a more environmentally friendly way of dealing with storm water management.

"We kind of stumbled into this whole thing at first," he said.

What Burton stumbled into is a development strategy that is taking hold in many locations across the country, according to Ruth Wallace, a low-impact development expert with the Missouri Department of Natural Resources. Low-impact development, or LID, is "turning conventional storm water management upside-down," Wallace said.

"In conventional storm water management, the objective is to move water off-site as fast as possible," she said.

With conventional storm water management, water is not the only thing being moved off site. Fast-moving storm water picks up herbicides, pesticides and fertilizers from lawns as well as automotive chemicals from roads and driveways. Add eroded soil to the mix, and this "nonpoint source" pollution is a key contributor to water pollution in the state. A central tenant of LID is to slow – and in some cases, stop – the flow of storm water off site from a development. Curbs and gutters, storm water drainage pipes and retention basins are replaced by a number of what Wallace calls "micro practices" – small-scale, decentralized features that increase the infiltration and evaporation of rainwater before it leaves the site.

The strategy is to recognize site designs that work with natural hydrology and install practices such as narrower streets with fewer cul-de-sacs, rain gardens, infiltration trenches and planter boxes. Rain gardens with deep-rooted native plants work to treat pollutants, to reduce the amount of pesticides and fertilizers needed and drain surface water within the day.

"It can be applied on almost any scale," Wallace said. "It can be applied on a lot scale;

Flow

Storm Water Management



it can be applied on a neighborhood scale; it can be applied on a sub-watershed scale.”

Burton’s inadvertent discovery prompted him to rethink a development he already had on the drawing board – a 157-acre, 75-unit subdivision near Kearney called Oakbrook. After immersing himself in low-impact development information, Burton decided to scrap the plans already laid for Oakbrook, including all of the initial engineering work, and start again.

Turning Oakbrook from a conventional to a low-impact development required more than educating himself. Burton also had to convince planning and zoning officials in Clay County as well as the engineers and contractors he hired.

He not only sought help from local LID experts such as Wallace, but from nationally recognized experts as well, including Larry Coffman, who originated many of the concepts and practices of LID while working as the associate director of the Prince George County, Maryland, Department of Environmental Resources.

Even the most casual observer immediately notices Oakbrook’s lack of conventional curb and guttering, which has been replaced by a flat ribbon curb. A closer look reveals the oversized cul-de-sacs, which serve as



I Beg Your Pardon ...

What You Need to Know About a Rain Garden

Rain gardens play a key role in making Brian Burton’s Oakbrook neighborhood a low-impact development. While those gardens are part of Oakbrook’s overall storm water management plan, any homeowner can decrease his impact on our state’s waterways – and beautify his landscape – by adding a rain garden.

Many organizations offer step-by-step directions in how to plant a rain garden, all of which come down to three basic elements: location, preparation and selection.

Location

When trying to determine where to plant your rain garden, look first at the property’s existing drainage patterns. Where does the water currently go when it comes off the driveway or out of the downspouts? It’s hard to stop or slow down storm water if the rain garden is not between where the water originates and where it is heading.

In order to avoid basement moisture problems, most publications recommend that rain gardens be planted at least 10 feet from the house.

Preparation

Rain gardens retain water because the beds of these gardens are dug out below grade. Most rain garden plans call for the bed to be dug out anywhere from 4-12 inches, depending on the volume of water it is expected to stop. Amending the soil with a combination of sand, topsoil and organic matter helps improve percolation.

Selection

The type of plants used in a rain garden will depend on a number of variables, including the location (does the bed receive full sun, partial sun or mostly shade?), and other uses that the gardener might have for it (e.g. attracting wildlife). While the variables may change some elements of the garden, there is one recommendation that is universal – use species of plants that are native to the area.

Native plants tolerate short periods of standing water. Their deep root systems, which make them drought tolerant, improve percolation. The Grow Native Web site – a joint venture of the Missouri departments of Conservation and Agriculture – has a number of recommended species for rain gardens.

Resources

Both the Mid-America Regional Council in Kansas City and the James River Basin Partnership, headquartered in Springfield, offer brochures with greater detail on establishing a rain garden. Go to [www.marc.org/environment/Water/homeowners.htm] and click on rain gardens at the bottom of the page; and [www.ci.springfield.mo.us/egov/publicworks/storm_water/], click on rain gardens in the sidebar menu.

Information on native plants is available at [www.grownative.org].



(Above) The stones in a storm water field inlet catch floating trash while plants and native grasses help filter the water before it reaches the inlet. (Above right) Rain gardens rely on grading, soil development and native plants to improve natural drainage of storm water and reduce the amount of water leaving the property. Each lot in the Oakbrook Subdivision has its own storm water management plan that includes the use of rain gardens.

large, neighborhood rain gardens. The rain gardens in each of the lots appear to be typical landscaping, disguising their true purpose as storm water management features.

“Each lot has its own storm water management plan,” Burton said. These plans typically include shallow depressions, called swales, which direct water toward the rain gardens. Using a graded depression, amended soils and native plantings, these rain gardens trap and quickly absorb rainwater (see sidebar on page 9).

“You’ve got to have your rain garden plan before you can get your building permit from the county,” he said. The development’s covenant agreement requires that residents maintain their gardens.

As the grandson of farmers, Burton said he has always had an appreciation for the environment. As a developer, LID had to make more than environmental sense, it had to



make economic sense as well. He estimates that the switch saved him \$36,000, a number that would have been higher had he not already put time and money into initially pursuing the conventional development model.

The Center for Low-Impact Development, a not-for-profit organization started by Coffman and other LID proponents, estimates a development cost savings of up to \$5,000 per lot, including reduced site infrastructure costs, both in construction and maintenance. As more studies of such sites are completed, the economic benefits are becoming more evident, Wallace said.

“Initially, the concepts were just thrown out there, and they just seemed to make sense,” she said. “Now the data is following.”

Data is one thing, but Burton appreciates the ability to take prospective buyers on tours of the half-dozen lots already developed to give them a first-hand look at LID in practice. “It’s nice to have a project on the ground that’s actually working,” he said.

Being a pioneer means forging trails that make it easier for others to follow. Burton believes he’s found the trail with low-impact development that most developers will be following in the years to come.

“Now that I’ve been through it, I wonder why more people don’t build subdivisions this way,” Burton said. 🌞

Larry Archer is division information officer for the department’s Field Services Division.

No Stone Unturned

story and photos by Larry Archer

Using equipment more commonly employed to locate environmental hazards buried during the 20th century, Department of Natural Resources staff members helped the Morgan County Sheriff's Office locate graves dug during the 19th century.

Members from the department's Environmental Emergency Response section, Division of State Parks, and Division of Geology and Land Survey worked at a cemetery site southwest of Stover in September 2007, at the request of Morgan County Sheriff Jim Petty. Petty's office was investigating a report that the landowner had bulldozed the area, including the gravestones, that marked an estimated 20-30 graves.

Staff operating ground-penetrating radar used the high-tech equipment to get the low down on possible grave sites. Mounted on four wheels and pushed by a long handle, the radar unit resembles a large – but much quieter – lawn mower.

"This equipment is typically used to locate drums, utility or product lines," said environmental responder Brad Harris, who was among those who surveyed the site. "The ground-penetrating radar identifies underground features, or anomalies, consistent with a grave."

Based on the findings of the radar, officials used a backhoe to dig three- to four-foot trenches, allowing archeologists to examine the soil profile. The process of digging a grave changes the soil profile, allowing archeologists to identify the location as a likely gravesite.

"Basically what we were looking at were grave shafts that had been excavated and then back-filled," said Brant Vollman, an archaeologist with the department's Division of State Parks. "We were intentionally trying not to get deep enough to disturb the remains."

Sheriff Petty requested department assistance with locating enough of the graves to establish that the area had been a cemetery. Knowingly destroying a marked burial site is a felony, and the prosecution for vandalism of a cemetery is a local law enforcement issue. Morgan County officials filed charges against the landowner, but the case



Brant Vollman, left, an archeologist with the department's Division of State Parks, inspects a trench in search of a grave shaft. (Below) Environmental specialist Doug Thompson, center, searches for possible grave sites using ground-penetrating radar. With him are Morgan County Deputy Thomas Wright, left, and environmental specialist Brad Harris.

was still pending as of the time *Missouri Resources* went to print.

While the department has no legal jurisdiction in cemetery vandalism cases and does not typically get involved in identifying or investigating grave sites, it does assist in criminal investigations when asked by law enforcement and when resources are available. 🌞

Larry Archer is division information officer for the department's Field Services Division.





HOUSES IN Simple Cleaning Sufficient

Four Missouri state agencies combined facilities, staff and equipment in order to confirm the results of previous studies regarding the cleanup of meth labs.

1) Sealing up the hazmat suit protects researchers; 2) Meth is cooked in a sealed room with environmental conditions closely monitored; 3) The required items for a meth lab are laid out on a shelf; 4) State personnel are in constant contact with the “meth house” as operations are conducted; 5) Testing participants check their equipment and protective gear before and after being exposed to meth cooking.

Methamphetamine’s devastating effects on the drug’s users have been well documented for years.

What effect manufacturing, or “cooking,” meth has on the properties in which it is made – and what steps need to be taken to make those buildings safe again for occupancy – has been less well documented.

Determining how badly meth production contaminates a home and what level of cleanup is needed to make the home safe for future residents was the focus of a 2007 study headed by the Missouri Department of Natural Resources and the Department of Health and Senior Services.

“Properties previously used to manufacture meth pose potential health risks to occupants,” said Michelle Hartman, health program representative with the Department of Health and Senior Services’ Bureau of Environmental Epidemiology.

A previous look at the topic in 1998 resulted in the development of the state’s current “common-sense” approach on meth cleanup that focuses on simple cleanup practices rather than the more extensive – and expensive – cleanups some states now require, according to Hartman.

Further testing in 2005-2006 provided support for this common-sense approach and found that these properties may not be nearly as contaminated as some previously had believed. However, to confirm that assertion, officials wanted to reinforce earlier findings with more conclusive data.

“The purpose was to see if a simple cleaning was effective in removing meth residue,” Hartman said. “We wanted to make sure those cleanup guidelines are adequately protective.”

While previous studies tested former meth lab houses, the most recent effort was



by Larry Archer
photographs by Scott Myers

for Former Drug Labs

designed to give officials more control over the process, said Brad Harris, chief of the special projects unit within the Department of Natural Resources' Environmental Services Program.

Assisted by the Missouri State Highway Patrol, and using an Office of Administration-provided abandoned building on the former Missouri State Penitentiary site, researchers set up their own meth labs.

"If we could cook our own dope and control the environment, we hoped we could come up with more consistent data," Harris said. "We set up two different labs to cook the meth using the two most common methods. We tried to model our own cooks after how the actual cooks would create the drug – only safely."

Each lab included samples of common household surfaces such as countertops, flooring, paneling and painted drywall. Fol-

lowing the "cooking," each surface was tested for meth contamination, cleaned using common household cleansers and retested for meth residue.

This controlled testing produced similar results to those seen in previous testing of actual meth houses and confirmed that a simple cleaning can be effective, reinforcing the earlier recommendations. Those guidelines are currently provided in the State of Missouri's meth lab cleanup page at [www.dhss.mo.gov/TopicsA-Z/MethLabCleanupGuidelines.pdf].

While meth is nothing but bad news for users, this study provides good news for those responsible for a drug lab cleanup, or looking to rehab a house or apartment with a checkered past. ☀

Larry Archer is the information officer for the department's Field Services Division.

Missouri State of the Environment Report 09

The Department of Natural Resources' biennial report on the state of Missouri's environment was released in December. Individual sections address: Compliance Assistance and Improvement; Our Soil and Water Resources; Energy Resources in Missouri; Our Air; Our Land; and Our Parks and Historic Sites. The report can be reviewed on the Web at [www.dnr.mo.gov]. A limited number of hard copies are available by calling 1-800-361-4827.



New Historic Site Recalls Civil War

Missouri's newest state historic site will commemorate one of the most significant milestones in the Civil War. The Department of Natural Resources has acquired property that is associated with the Battle of Island Mound where black soldiers engaged in combat for the first time in the Civil War.

The 40 acres of property, located southwest of Butler, contains the location of the bivouac area of a farm the soldiers called "Fort Africa." The skirmish or "Battle of Island Mound" occurred nearby on Oct. 29, 1862, when approximately 30 black troops were ambushed by rebel horsemen near a low hill known as Island Mound.

Site development will focus on access and interpretation. The Missouri State Parks Foundation will be involved in fund-raising to help offset development costs. An archeological assessment will begin this winter, followed by the conceptual development plan process, then design and development. The dedication target is Oct. 29, 2012, the 150th anniversary of the battle.

Programs Nominated For Governor's Award

Seven teams from the Department of Natural Resources were nominated recently for the Governor's Award for

Quality and Productivity. Teams nominated for this award include:

Permit Assistant: This team developed an online application that guides users through a series of questions to determine what types of permits their facilities require.

Environmental Assistance Visits: The department implemented EAVs as a technical service to help regulated facilities understand and comply with environmental regulations.

Expanded satellite offices: This team worked to expand the department's network of satellite offices, which has been a highly efficient way to improve customer service and provide a range of regulatory activities in the surrounding communities.

Soil and Water Conservation Program: Staff were recognized for standardizing grant procedures, saving time and money for the state and local soil and water districts.

E-cycle Missouri: A team developed this three-pronged approach to help Missourians safely dispose of their e-scrap.

Succession Planning Leadership Program Steering Committee: This committee was formed to help create a ready pool of continual candidates prepared to move into technical and managerial leadership roles in the Department of Natural Resources.

Emergency Situation Alert System: This team developed an Emergency Situation Alert System to enable the department to quickly send messages through its computer network should an intruder enter state property.

Monumental Work Now Under Way

Original survey markers, some made of wood posts, rocks or mounds of earth, have been lost through time. Many were placed between 1815 and 1855 using the cadastral system developed by Thomas Jefferson. These surveys created one mile-square sec-



tions and remain the basis for all real property in the state. The markers are part of what is called the Public Land Survey System.

The good news is that 44 Missouri county commissions and their respective county surveyors entered into contracts in 2008, with the Department of Natural Resources to restore 279 such land survey monuments. The new, permanent monuments, to be placed this year, include caps that are stamped to identify the corner. They are an accurate source of information for resolving property boundary disputes and related questions.

The Land Survey Program is responsible for maintaining the Public Land Survey System in Missouri. At its inception, it was determined that more than 90 percent of the original survey markers in the state had been destroyed or obliterated. The Missouri General Assembly realized that this situation created major problems with property boundary decisions. As a result, since the mid-1970s, more than 8,000 new markers have been replaced or reestablished by the county surveyors with funds provided by the various county commissions and the Department of Natural Resources. Additional information about the work of the Land Survey program is online: [www.dnr.mo.gov/geology/landsurvey/].

Ombudsmen Visit 6,000 Sites

During the first three years of the Missouri Department of Natural Resources' popular Ombudsman Program, the ombudsmen have completed more than 6,000 site visits across the state. The department established the program in August 2005 to help strengthen the department's relationships with Missouri's communities, businesses and individuals, to facilitate communication between staff and Missouri citizens and to make technical and financial assistance available.





environmental notes

Through the program, an ombudsman is located at each of the department's five regional offices and the department's Division of Geology and Land Survey Office in Rolla.

Through personal visits, ombudsmen help promote the department's Tire Dump Roundup Program, which allows private property owners to self-report tire dumps on their properties and have them cleaned up for free. Ombudsmen also visited 177 salvage operations to encourage participation in the End of Life Vehicle Solution Program, or ELVS, a program designed to help salvage yards remove mercury switches from scrap vehicles before recycling them.

The ombudsmen also met with 102 heating, ventilating and air conditioning contractors and wholesalers to encourage participation in a cooperative designed to recycle wall-mounted mercury thermostats. The ombudsmen, along with the department director, have facilitated more than 100 town hall meetings with more than 1,670 Missourians across the state.

For more information about the Ombudsman Program, visit the department's Web site at [\[www.dnr.mo.gov/ombudsman.htm\]](http://www.dnr.mo.gov/ombudsman.htm).

Historic Preservation Office 40 Years Old



The Missouri State Historic Preservation Office is celebrating its 40th anniversary. The State Park

Board, now the Department of Natural Resources' Division of State Parks, created SHPO on July 1, 1968. SHPO was originally known as the State Historic Survey and Planning Office.

Since 1968, the underlying mission has remained: to identify, document and seek to preserve Missouri's rich cultural heritage and historic places. The state's Cultural Resources Inventory now includes information on more than 370,000 of Missouri's historic buildings, archaeological sites and other historic resources.

Plastic Getting Corny?

Is it biodegradable? Is it compostable? Or will it remain in the environment for 100 to 1,000 years?

Plastics, usually petroleum based, are a key ingredient of our carefree, throw-away lifestyle. Plastic containers have a role in food storage and beverage portability or within the packaging of many small items or shrink-wrapped pallets of large items. Made from oil, the material may last forever.

Plastics appear in many forms: hard, soft, colored or clear – depending on their polymer makeup. Polymers are the repeated arrangement of molecules due to a chemical reaction into a specific structure – such as polyethylene terephthalate (PET) or extruded polystyrene (EPS).

Although more than 3 million tons of polystyrene are produced every year in the United States, very little of it is recycled.



The quest for plastics that decompose or biodegrade to basic substances such as carbon dioxide and water has been complex and expensive – so far. A blend of corn or potato starch, used in packaging, can dissolve after weeks or months of contact with water and heat. A California firm now provides fast-food packaging made of a mix of limestone and potato starch. They also sell biodegradable picnic utensils.

Chemists in Ireland have devised a way to melt polystyrene into styrene oil – which occurs naturally in peanuts, strawberries and meat. This oil is then fed to soil bacteria, *Pseudomonas putida*, which converts it to a biodegradable plastic called polyhydroxyalkanoates or PHA. It can be used in plastic film or tableware and is resistant to heat, grease and oil. Unlike EPS, it dissolves in soil and water. Another form of bacteria can feed on sugars in fermentation and produce a plastic called polyhydroxybutyrate (PHB) or it also can be grown in genetically modified plants.

Gaining ground due to the high cost of oil is a potential replacement for plastic beverage containers. In Blair, Neb., Cargill-owned NatureWorks, the largest lactic acid production plant in the world, turns out a corn-based resin known as polylactic acid (PLA). Producing PLA is said to use 65 percent less energy than producing the more common plastics, generates 68 percent fewer greenhouse gases and contains no toxins.

Wal-Mart and natural foods merchants such as Newman's Own Organics, Noble Juice and Wild Oats have been using PLA in a variety of containers. Wal-Mart executives expect that the use of 114 million PLA containers would save 800,000 barrels of oil each year. NatureWorks estimates that using corn instead of oil to produce 100,000 32-ounce plastic bottles would save the equivalent of 1,000 gallons of gasoline or the amount of electricity consumed by 27 U.S. residents per month.

The trouble with PLA is it starts to melt at 114 degrees and temperatures inside a hot car can reach more than 200 degrees. It also needs to be composted at 140 degrees for 10 days and there are only slightly more than 100 of these industrial-type composters nationwide. The corn used to make PLA is also in high demand for ethanol, animal feed and human consumption.

With some effort, the 2000 Olympics in Sydney recycled or composted 76 percent of the 660 tons of waste generated each day. Biodegradable plastics helped make this possible. We can expect to see more of them.

News Briefs

Over the past 40 years, SHPO and its partners have listed 1,940 properties, representing 35,000 historic resources, in the National Register of Historic Places, documented 26,000 archaeological sites and completed the architectural and historic survey of more than 100,000 historic buildings and structures.

SHPO and the National Park Service have entered into preservation partnerships with 46 Missouri communities, each dedicated to preserving their unique historic character. Individuals have also played a major role in preserving Missouri's historic commercial and residential buildings and districts.

Using state and federal rehabilitation tax credits, more than \$2 billion has been invested in rehabilitation of Missouri historic buildings in the past 10 years.

February is Earthquake Awareness Month



What do April 18, May 5 and November 4, 2008 all have in common? On these days,

Missourians experienced ground shaking in the form of earthquakes measuring magnitudes 5.2, 2.7 and 2.6, respectively. The quakes, centered near Belmont, Ill. and Fenton and Lebanon, Mo. are reminders that earthquakes occur in the central United States. When will the next big earthquake hit? There is no way of knowing for sure, but geologists and other earthquake experts meet in February to educate the public about why and when earthquakes happen, and what you should do if the "big one"

hits. The Department of Natural Resources' Division of Geology and Land Survey, the State Emergency Management Agency, the Missouri Seismic Safety Commission and others will participate in a number of events across the state throughout the month of February. Current data show a 90 percent chance for a magnitude 6.0 or greater earthquake by the year 2040. This would impact a four- to eight-state region.

The New Madrid Seismic Zone averages more than 200 measured earthquakes per year – about 20 per month. Visit the department's Web site for a list of activities planned for Earthquake Awareness Month. The site also features information about earthquakes and other geologic hazards at [www.dnr.mo.gov/geology/geosrv/geores/geohazhp.htm].

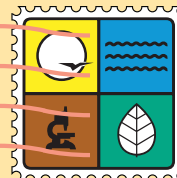
Thank you for the article, "More than Ever ... Recycling Still Worth the Effort," that appeared in the Spring-Summer 2008 edition of *Missouri Resources*. I was surprised to learn how much waste is generated in Missouri each year and disappointed to learn about the volume of trash that could be recycled – but isn't.

I appreciated the list of recycling tips in the article and would like to add the following suggestions to save energy and reduce waste:

1. Conserve hot water – turn down your hot water heater and insulate both your water heater and exposed pipes.
2. Use fluorescent light bulbs.
3. Install low-flow showerheads and faucets.
4. Plant trees to shade your house in the summer.
5. Encourage your community leaders to establish recycling centers for steel, glass and plastic.
6. Place a block in your toilet tank to reduce the amount of water you use.
7. Always water your lawn in the morning to avoid evaporation.
8. Commit to buying products made from recycled materials.
9. If you want to drink bottled water, fill up a bottle from your faucet and take it with you. (Plastic water bottles are the fastest growing refuse being placed in landfills.)

If everyone follows just a few of these energy-saving and recycling tips, our energy consumption will drop dramatically and the amount of waste sent to our landfills will also be re-

Letters



duced. I hope that you will include energy consumption and recycling tips in each issue of *Missouri Resources*.

W. Dudley McCarter
St. Louis

My name is Dylan Roy, I am 16 years old. I read your article about recycling. I think it is a very good idea to recycle. It helps protect our earth and keep it clean. I think it is better to recycle than to throw everything in a landfill. It is also a good idea to put the article in the *Missouri Resources* because a lot of people read the magazine and they will realize that it is a good thing to recycle. I recycle a lot. I recycle cans, paper and other things. My grandpa owns a recycling business in Arizona. He got me started on recycling. He told me to collect all my pop cans and other things and I could make some money. I have been recycling for a long time. I think it is a good idea to recycle because it will help keep the earth clean.

Dylan Roy
Trimble

Letters intended for publication should be addressed to "Letters," *Missouri Resources*, PO Box 176, Jefferson City, MO 65102-0176 or faxed to (573) 522-6262, attention: "Letters." Please include your name, address and daytime phone number. Space may require us to edit your letter. You also can e-mail *Missouri Resources* staff at moresdnr@dnr.mo.gov

Million-Dollar Fleet From Taum Sauk Settlement

The Department of Natural Resources has acquired a fleet of six environmental emergency response trucks, purchased as part of the settlement from the 2005 Taum Sauk Reservoir breach. Department Director Doyle Childers accepted the more than \$1 million worth of vehicles from Ameren at a brief ceremony at the department's headquarters in Jefferson City.



Ameren's purchase of the trucks, which were manufactured by Precision Fire Apparatus, Camdenton, was part of the settlement resulting from the Dec. 14, 2005, breach of Taum Sauk Reservoir. Five of the six trucks have been distributed to the department's regional offices throughout Missouri and the sixth is housed with the department's Environmental Services Program in Jefferson City.

The Taum Sauk Reservoir failure hit Johnson's Shut-Ins State Park with more than 1.3 billion gallons of water, causing extensive damage to the park and injuring the park superintendent and his family. At the time, Johnson's Shut-Ins State Park was one of the state park system's most popular state parks. With approximately 8,550 acres, the park drew nearly 250,000 visitors yearly.

Portions of the park have been open during the summers of 2006 through 2008. Current plans call for the park to be reopened in 2009.

Clean Water Initiative Supports Funding



The Department of Natural Resources is providing \$134,673 toward water infrastructure improvements for Missouri communities through the governor's Clean Water Initiative.

The city of Cosby in Andrew County was awarded \$82,600 to construct a wastewater treatment and collection

Stream Team Notebook

Group Home Inspires Young Men

Kyle Bentley, Missouri Division of Youth Services, believes when troubled youth are given opportunities to connect with nature, it teaches lessons that help them reconnect to society and their families. This is why Stream Team and water quality monitoring activities are a great match for Bentley and his work with youth.

Bentley is manager of Wilson Creek Group Home, Springfield. His degree in wildlife conservation makes it perfectly natural for him to follow the creed posted in his office, "Real Men Love Wilderness."

There is a standard classroom at the group home but most of the youth prefer hands-on learning.

Spending an afternoon monitoring at one of six Stream Team 1477-adopted sites on the James River is a fun, learning adventure. Bentley says all of the boys enjoy this activity. They are surprised at what lives hidden in the bottom of the river. They can't wait to see what is revealed in each dip of the net and will often check to find what lives under rocks along the river bank. This closer examination of what is in the world around them is what they are currently being asked to do in their own lives.

The boys cycle through Bentley's leadership every three months. Each group is given the opportunity to bike on the Katy Trail, hike the Ozark Trail, camp, have map and compass training and demonstrate their newfound skills to others at special events.

The Division of Youth Services recently won a national award from the Annie E. Casey Foundation for Innovations in American Government. Wilson Creek continues to be honored with local awards. They have already garnered three awards from the James River Partnership for Stream Team 1477's outstanding efforts to remove the most difficult trash from the river.

The Division of Youth Services program has been so successful that the state of California has adopted their principles and some of the same goals that Bentley uses and the Stream Team Program promotes.

The Stream Team Program is a cooperative effort between the Missouri Department of Natural Resources, the Missouri Department of Conservation and the Conservation Federation of Missouri.

For information about the Stream Team Program, visit [www.dnr.mo.gov/env/wpp/VWQM.htm] or [www.mostreamteam.org].



Kyle Bentley, center, right, and students count and identify invertebrates in a kick net. Bentley's Stream Team 1477 monitors six sites on the James River.

DNR photo by Susan Higgins



TIME EXPOSURES



Photo courtesy of Joplin Public Library

Mining lead or zinc around Joplin could be hazardous to miners' health. Data from 1912 reveals 200 people in Jasper County died of lung disease that year. Their families also caught the disease. Cold, wet clothing, poisonous gases, blasting, mine collapses and accidental falls also added to the hazards. Forty-two men were trapped 230 feet below ground when 10 acres of land, honeycombed by mine shafts, suddenly collapsed. All were rescued and only 10 were injured. The only lights for early miners were candles carried on a bracket fixed to the front of their caps. This photo, taken underground near Joplin in 1906, is from the Galen Augustus collection and the Joplin Public Library.

Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. All pictures will be returned via insured mail. Pre-1970 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that might be of interest to our readers.

- \$12 million for rural drinking water projects.
- \$10 million in direct loans for water or wastewater projects, including planning loans for wastewater facilities.

Botanical Garden Hosts Anniversary



The Missouri Botanical Garden celebrates its sesquicentennial anniversary in 2009. It opened to the public on June 15, 1859, making it the oldest botanical

garden in continuous operation in the nation. The Garden will honor the occasion with activities and events throughout the year.

The anniversary theme, "Missouri Botanical Garden: Green for 150 Years," acknowledges the institution's past and present leadership in promoting a sustainable future.

Henry Shaw, a native of Sheffield, England, came to St. Louis in 1819 and established a business selling hardware and cutlery on the Mississippi River. His business boomed and he spent retirement touring the world. Shaw was especially taken with the great gardens of Europe. Inspired, he set about creating a gift for his beloved City of St. Louis: the Missouri Botanical Garden. Today, the Garden showcases 79 acres of landscaped displays and structures.

The Missouri Botanical Garden is located at 4344 Shaw Blvd. in south St. Louis, less than 10 minutes from downtown and easily accessible from Interstate 44.

For more information, visit [www.mobot.org] or call the 24-hour recorded hotline at (314) 577-9400 or toll-free, 1-800-642-8842.

For news releases on the Web, visit [www.dnr.mo.gov/newsrel/index.html]. For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at [www.dnr.mo.gov/calendar/search.do].

system. The funds will be used in conjunction with a grant and loan from the U.S. Department of Agriculture-Rural Development, a grant from the Missouri Department of Economic Development-Community Development Block Grant and a loan from the Missouri Development Finance Board. The total estimated cost of this wastewater treatment project is \$1,605,000.

The city of Verona in Lawrence County was awarded a \$52,073 to add ultraviolet disinfection to the existing wastewater treatment facility. The funds will be used in conjunction with

loan funds from the Department of Natural Resources. The project is estimated to cost \$104,146.

The Clean Water Initiative is administered by the department's Water Protection Program and is limited to counties, municipalities, and water or sewer districts. So far, \$50 million has been distributed as follows:

- \$16 million for 40 percent State Construction grants for wastewater related projects.
- \$12 million for rural sewer grants targeted for rural and special needs communities.

Don Robinson Protecting the Land He Loves

Don Robinson of University City wants to make sure that the land he loves is protected in the future and made available for the public to enjoy as much as he does. That is why he has decided that upon his death, he would donate his estate to the Missouri Department of Natural Resources for use as a state park. The donation will include at least 843 acres of land in Jefferson County, his house and other structures, and a trust fund to help maintain the area once it becomes a state park.

Robinson describes the land as “wild and woolly with lots of canyons.” The acreage is in the upper watershed of the LaBarque Creek, a high quality stream supporting 36 species of fish. Its location is key to LaBarque Creek Watershed Conservation Opportunity Area. The property features sandstone box canyons, cliffs, shelters, glades, upland and bottomland forests, and 328 recorded species of plants. Native shortleaf pine occurs in the area, and may represent the northernmost location of this species in Missouri.

The land represents a natural landscape of statewide significance and offers an area for recreation near the St. Louis metropolitan area. The donation also is significant because it includes a trust fund that will give the department the financial resources to manage and maintain the property in the future.

Robinson, a self-made businessman, became successful by producing and marketing a cleaning product and developing sub-

divisions. He began buying land in the Jefferson County area in 1964 and continued adding property until it reached 843 acres, “the exact same size as Central Park in New York City,” Robinson said.

When Robinson first bought the land, he said a farming neighbor told him, “All you can raise up there is hell.” But I liked it because it was hilly and rough.”

His love for the rugged land is one reason he decided to donate it to the state park system through his estate. “I wanted to make sure that it was kept in one piece and that it would not be changed. I know that you [the department] will take care of it and that way, someone else can enjoy it, too,” he said.

“We are very pleased to know that we will be receiving this property into the state park system in the future and we thank Don for his generous donation,” said Doug Eiken, director of the department’s Division of State Parks.

The land currently is still considered private property but Robinson is willing to answer questions about the property and can be reached at 636-274-2424.



DNR photo by Jenny Frazier

Don Robinson

Wayne and Debbie Corse Sustainable Farmers

Wayne Corse is a busy guy. In fact, it took a force of nature – a day too rainy for fieldwork – to slow him down long enough for an interview.

Wayne and his wife, Debbie, took over her family business, a 2,600-acre farm near Charleston, after Debbie’s parents retired. As the couple began managing the farm, they found their education backgrounds coming to life in the fields they were planting.

“Debbie and I each have masters’ degrees in wildlife-related disciplines so being planet-friendly in what we choose to do comes naturally,” Wayne said.

The farm grows wheat, grain sorghum, corn and soybeans. The Corses have implemented no-till farming, which reduces water runoff that can carry away fertilizers, pesticides and soil and also leaves some end-of-season crop residue and grain for over-wintering wildlife. The couple also has planted, in cooperation with various governmental agencies, field borders, filter strips and tree screens to improve wildlife habitat. The farm has become a working model of agricultural sustainability.

“We also recycle oil and follow EPA guidelines for application of pesticides,” Wayne said.

The Corses have received numerous recognitions of these efforts, including the Missouri Wildlife Societies’ Farmer/Wildlife Award, presented by The Missouri Chapter of the Wildlife Society. They also recently received the Midwest Conservation Legacy Award, presented by the American Soybean Association.

In its seventh year, the Conservation Legacy Awards Program is a national program designed to recognize the outstanding environmental and conservation achievements of U.S. soybean farmers. Selection is based on each farmer’s environmental and economic program.

For farmers also interested in implementing “green” measures, Wayne recommends contacting the U.S. Department of Agriculture’s local Natural Resources Conservation Service of-

fices for information about programs designed to assist agricultural producers. He emphasizes the dual importance of sustainability in choosing environmentally friendly techniques – farming methods that not only help sustain the planet and those that the planet can sustain, but also that will help sustain the farm operation over a long period of time.

“If you aren’t profitable you won’t be around long,” he said.

Wayne Corse’s academic emphasis is herpetology, the study of reptiles and amphibians, and his thesis dealt with a specific species of frog. Amphibians have recently become the proverbial canary in the mine, as loss of habitat, disease pollution and climate change threaten many amphibian species. In Missouri, protection of the Ozarks Hellbender has been closely tied to improved local water quality.

The Corses are also helping cultivate an interest in protecting Missouri’s water, land and air quality among another of the state’s precious resources – Missouri youth. School groups often visit the Corses’ farm – an outdoor classroom – to learn about Missouri’s diverse wildlife and the impact that their choices may someday have on wildlife habitats. While visiting the Corse farm, children have an opportunity to view fish and snakes up close. At the end of a presentation, they leave with an important message.

“At the end of each classroom session, we stress that the species that we have just discussed are special, interesting and need our help to survive through future generations,” Wayne said.



Debbie and Wayne Corse

Nathan Boone Homestead State Historic Site

by David Roggensees
photographs by Scott Myers



Visitors Laurie Pedergass, Yvonne Ankrom and Kaitlynn Ankrom from Ash Grove listen to the story of Nathan Boone as told by site administrator David Roggensees.

Nathan Boone Homestead State Historic Site tells the story of the great pioneer Nathan Boone and his family. It accomplishes this by preserving three primary assets, the natural and cultural landscape of the farm, the Nathan Boone home and the story of the Boones.

Nathan Boone, the son of legendary frontiersman Daniel Boone, was born in 1781 in Kentucky. He began his career as a market hunter who harvested deer and beaver for the world market.

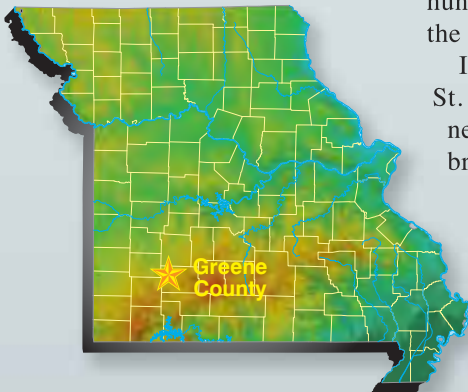
In 1799, he moved to what is today the St. Charles area and built a home for his new bride, Olive. In 1805, he joined his brother, Daniel Morgan Boone, in establishing the Boone's Lick salt works, known today as Boone's Lick State Historic Site near Boonville.

Through his early career as a hunter, Boone acquired a geographical knowledge of Missouri so extensive, that in 1808, he was selected by

William Clark to guide an overland military expedition to establish Fort Osage on the Missouri River. Clark sent Boone to travel to the Osage Indian village and convince them to come to Fort Osage and negotiate a treaty. Nathan was successful.

During the War of 1812, Boone defended the Missouri frontier as a captain of the Missouri Rangers. After the war, he worked as a farmer and surveyor. His work as a surveyor gave him an unrivalled knowledge of the landscape of Missouri and even Iowa, where the Boone River and Boone County, Iowa, are named for him.

In 1820, Boone was a delegate to the convention that wrote Missouri's first state constitution. That constitution, though it did many good things, also brought Missouri into the United States as a slave state. Born in the slave state of Kentucky, Boone participated in slavery. Boone Homestead was one of the largest slave-operated farms in Greene County.





In 1833, at the age of 52, Nathan became a captain in the 1st U.S. Dragoon Regiment of the United States Army. President Andrew Jackson wanted frontiersmen to help carry out his policy of removing American Indians from the eastern United States and relocating them to the Indian Territory. Boone accepted the well-paid position.

As early as 1834, Boone and his sons began acquiring land near today's Ash Grove to build the family home. Boone and his wife Olive moved into the house in 1837 although Boone continued his military career.

When Nathan Boone took his family west, it was in a quest for land with resources that they could utilize to earn a living. They found these resources at what is today the Nathan Boone Homestead State Historic Site. The home site featured six springs for water and supported a savanna-type landscape with a mixture of prairie grass and trees. The trees, essential for building and fuel, consisted of oak, walnut and ash. The prairie featured stands of big and little bluestem, sideoats grama and Indian grass, providing grazing for sheep, cattle, hogs and horses. The soil, although thin in many areas, was fertile and supported crops of corn, oats and wheat, along with orchards of peach and apple trees.

The buildings of the homestead were built from materials available on the site. The hewn-log house, the featured artifact of the historic site, was built by Boone's sons and his slaves. Although it was built from local materials, it was one of the finest



homes in frontier Greene County. Its foundation was made from fieldstone, the fireplaces were made of cut limestone blocks, the logs of the house were hand-hewn logs of ash and walnut and the shingles of the roof were made of hand-split white oak.

Frederick Jackson Turner, historian of the American west, described a house very much like that of Boone's in *The Significance of the Frontier in American History*, writing: "emigrants purchase the lands ... put up hewn log houses, with glass windows, and brick or stone chimneys." The Nathan Boone house is a true artifact of the frontier and is in the National Register of Historic Places and is a Greene County Historic Site.

The Missouri Department of Natural Resources acquired the site in 1991 and has spent years restoring the homestead. The structure suffered through one hundred years as a rental property after the last Boones moved out in 1897. During the restoration, rotted logs were replaced, a chimney was rebuilt, clapboard siding was installed and a

(Left) Nathan Boone and his wife Olive are buried at the site.

(Above) An heirloom vegetable garden is planted each year so visitors can see what pioneers grew for food.



new shake shingle roof was put in place. Site staff then began to restore the interior woodwork. The original cellar was reconstructed and a plank fence placed around the yard.

One of the most interesting projects was the effort to restore the historic lime plaster in the house. Boone was well off for his day and the interior of the first floor of his home was plastered. Site staff reattached most of the original plaster to the origi-

nal split oak lath with a plaster adhesive. A consultant was then hired to train site staff to make and install lime plaster. The staff wet down the wood lath with water and alcohol and then applied new lime plaster. The material was made to replicate the original formula used by the Boones in places where the original plaster was lost. Approximately 300 square feet of missing plaster was replaced and all plaster surfaces were white washed. The restored home evokes a sense of connection between visitors and their frontier heritage and helps them physically experience the story of the Boones.

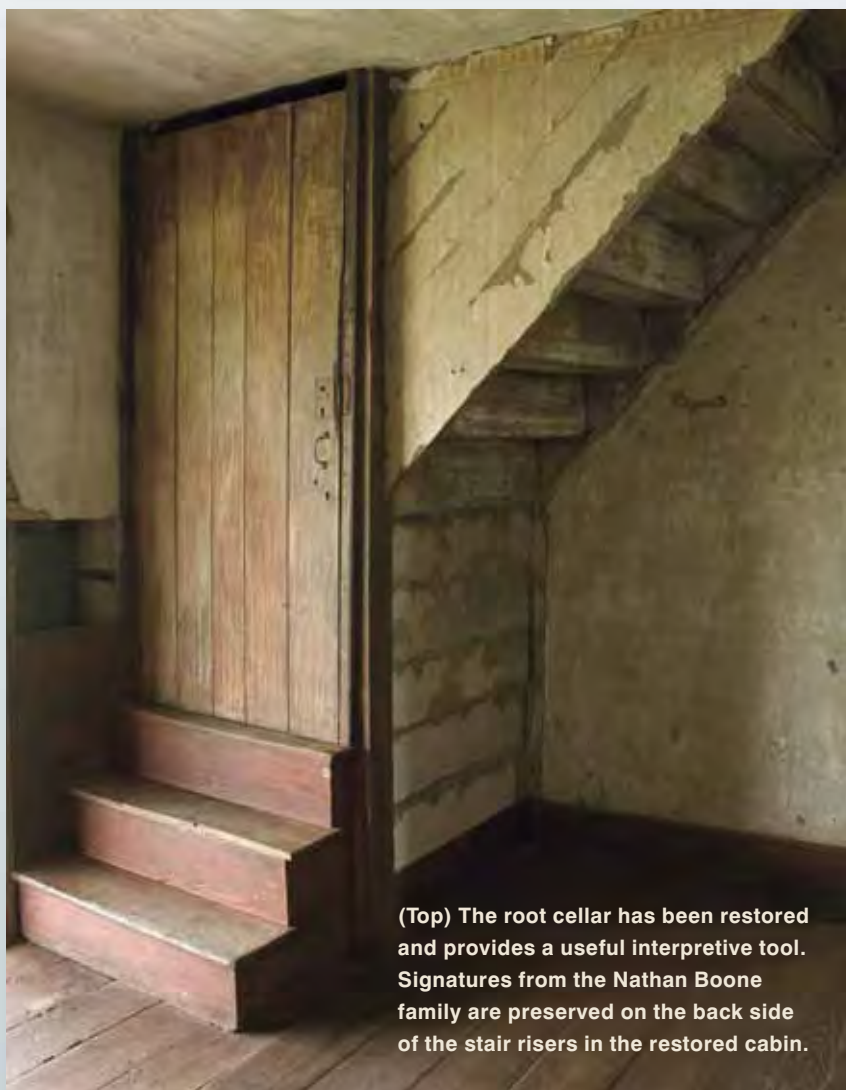
In 1849, Nathan returned home to Greene County after a hard and productive career. Some would argue that Nathan's career did more than his father's in aiding America's westward expansion. At the homestead in 1851, Nathan and Olive Boone retold the family's stories of settling the frontier to historian Lyman Copeland Draper, who was working to record the true story of Daniel Boone. These stories, documented on 300 hand-written pages, are the basis of much of our knowledge of the Boones' westward migration.

Nathan Boone resigned his commission in the Army in 1853, holding the rank of lieutenant colonel. He died at his home in Greene County in 1856. Nathan and Olive rest side by side in the Boone family cemetery at the homestead.

Nathan Boone Homestead State Historic Site is open for guided tours seven days a week from March through October. It is open in the winter months on a reduced schedule. The 400-acre site offers walking trails through the Ozark prairie and timber, a heritage garden and includes the Boone family and slave cemeteries, all located near the Boone house. A small picnic area also is available.

The premier event at the site is Nathan Boone Homestead Days, held each year on the third weekend of October. It features living history reenactors, craftspeople, music and lifestyle demonstrations. The third Saturday of each month, from February through November, the site showcases aspects of settling the frontier, including living history demonstrations, talks by historians, frontier music, star gazing or fun and games. The historic site offers visitors a chance to experience their frontier heritage.

David Roggensees is the Division of State Parks' site administrator for the Nathan Boone Homestead State Historic Site.



(Top) The root cellar has been restored and provides a useful interpretive tool. Signatures from the Nathan Boone family are preserved on the back side of the stair risers in the restored cabin.



Tiffany Campbell

Smog Buster From the Keystone State

By Byron Murray

photographs by Scott Myers

Tiffany Campbell is from Donora, a small town south of Pittsburgh. According to Campbell, "In the history of air pollution, Donora, Pa. has some significance. For a number of days in late October 1948, a temperature inversion over the town caused a heavy fog that held all of the pollution from the local factories close to the ground." Campbell explained that the fog then formed into a thick smog that caused the deaths of about 20 people, and made thousands ill.

On Oct. 31 the air was finally cleaned by a rain that fell over the area. Although many health professionals knew that the industries in town were causing the smog to get worse, most did not shut their furnaces down until a few hours before the rain cleared the smog away.

"This is one of the incidents that led to the federal Clean Air Act and other major clean air laws, because the nation was forced to acknowledge that air pollution could actually negatively affect human health, and even result in death," Campbell said.

Campbell attended the University of Pittsburgh and earned both her bachelor's degree in chemical engineering and master's from the University of Missouri. She enjoys her job and believes her work differs from the general perception of what engineers do.

"I actually talk to people," Campbell said. "I also enjoy pre-



(Above) Environmental engineer Tiffany Campbell, left, discusses the construction of air protection equipment in a new boiler with Greg Noble, manager of operations at City Utilities' Southwest Power Station in Springfield.

(Left) Greg Noble, City Utilities, left, Paul Myers, Air Pollution Control Program environmental specialist, and Campbell discuss the complex installation of a selective catalytic reduction device being added to the original boiler at the Southwest Power Station.



That decision is a major setback for Missouri and other states because they were relying heavily on this rule in their plans to reduce ozone, fine particles and regional haze.

Campbell also devotes a lot of time to tackling air-quality issues related to transportation fuels for the St. Louis and Kansas City regions. Both of these highly urbanized areas have special fuel requirements intended to address ozone pollution.

States are required by the Clean Air Act to develop and maintain a state implementation plan that provides the state's air pollution control strategy for meeting the federal requirements. The Missouri State Implementation Plan is submitted to the EPA and includes the state rules and plans that make up Missouri's air pollution control strategies.

“... I also like knowing that in the end, I am improving the environment that all of us live in.”

— Tiffany Campbell

(Above) Tiffany Campbell, APCP environmental engineer, discusses air quality concerns with Ron Boyer, a member of the Missouri Air Conservation Commission. The commission was touring the City Utilities' Southwest Power Station, Springfield.

senting information to people with the goal of making this information something a non-science person can understand. I also like knowing that in the end, I am improving the environment that all of us live in.”

Today, Campbell is an environmental engineer who works for the Rules and State Implementation Plans Unit in the Air Pollution Control Program. Much of her work involves talking with local stakeholders to explain air pollution problems and what needs to be done to improve air quality. This involves some very interesting and complex special projects.

Campbell is working with stakeholders in Kansas City and Springfield to develop a recommendation to the U.S. Environmental Protection Agency on which counties fail to meet the new federal ozone standard.

She also is facilitating a workgroup to address the fallout from the District of Columbia Circuit Court of Appeal's action to vacate EPA's Clean Air Interstate Rule, known as CAIR.

“When an area is determined to have pollution levels that exceed a level set by EPA, the air program works with local stakeholders to develop a plan to reduce the emissions of the pollutants causing these high levels,” Campbell said.

“In order to develop one of these [emission control] plans, a process involving local industry, environmental groups, pollution control agencies and other interested parties is started.”

Campbell's efforts in the Air Pollution Control Program help to ensure that thousands of Missourians can breathe easier in the metropolitan areas of the state.

For more information about career opportunities at the Missouri Department of Natural Resources, call the department at 1-800-361-4827 and ask for the Human Resources Program.

Byron Murray is a fiscal and administrative manager with the department's Water Protection Program.

Get Bizzy Saving Energy



by Kerry Cordray
photograph by Scott Myers

Anticipating winter, even insects and other critters work to seal up their dwelling places and store up supplies to get through the coming cold times.

Spiraling energy costs early this year raised widespread concern for the potential of record-setting home heating costs during winter 2008-09. Acting on these cost projections, the Missouri Department of Natural Resources and Public Service Commission, with utility providers, went to work conceiving new ways to inform Missourians about actions to save energy and reduce the impact of high energy costs on home bills.

Last fall, a “Be Energy Efficient” initiative was introduced. Appropriately and informally known as the “BEE” campaign, the centerpiece of the project is a new web site online at [www.BeEnergyEfficient.org]. The two agencies held an October news conference to promote the BEE project.

“Missourians can help themselves by making their homes, businesses and industries more energy efficient. It’s up to each of us to save energy in order to help control utility bills. With

the help of participating agencies and utilities, we want to make the BEE information available to many, many Missourians,” said Anita Randolph, director of the Department of Natural Resources’ Energy Center. “We know we have little individual impact on heating fuel prices, but we each have control over our own energy usage.”

In late December, propane costs had fallen to about 6 percent lower than they were at the same time in 2007, and natural gas costs were down 22 percent.

“The goal of the Bee Energy Efficient program is to educate consumers about the common-sense steps they can take to hold down the cost of their winter heating bills,” said Jeff Davis, chairman of the Missouri Public Service Commission. “Eliminating wasted energy is the easiest way for utility consumers to save money on their own winter heating bills and, if everyone does their part, will ultimately help lower the cost of natural gas and electricity.”

The BEE campaign employs the Web site, news media, publications, videos and public service announce-

ments to inform Missourians about no cost, low cost and long-term ways most Missourians can control their energy use and save money.

Kerry Cordray is a division information officer with the department’s Office of Communications.

Some of the most effective cold weather energy-saving actions include:

- Maintain air filters, furnaces and other heating equipment.
- Set your thermostat as low as is comfortable.
- Reduce air leaks.
- Take advantage of the sun’s heat and light.
- Add insulation to your attic.
- Turn down the temperature on water heaters and provide good insulation.
- Unplug electronics and appliances when not in use.
- Replace incandescent bulbs with compact fluorescent bulbs (CFLs).

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